

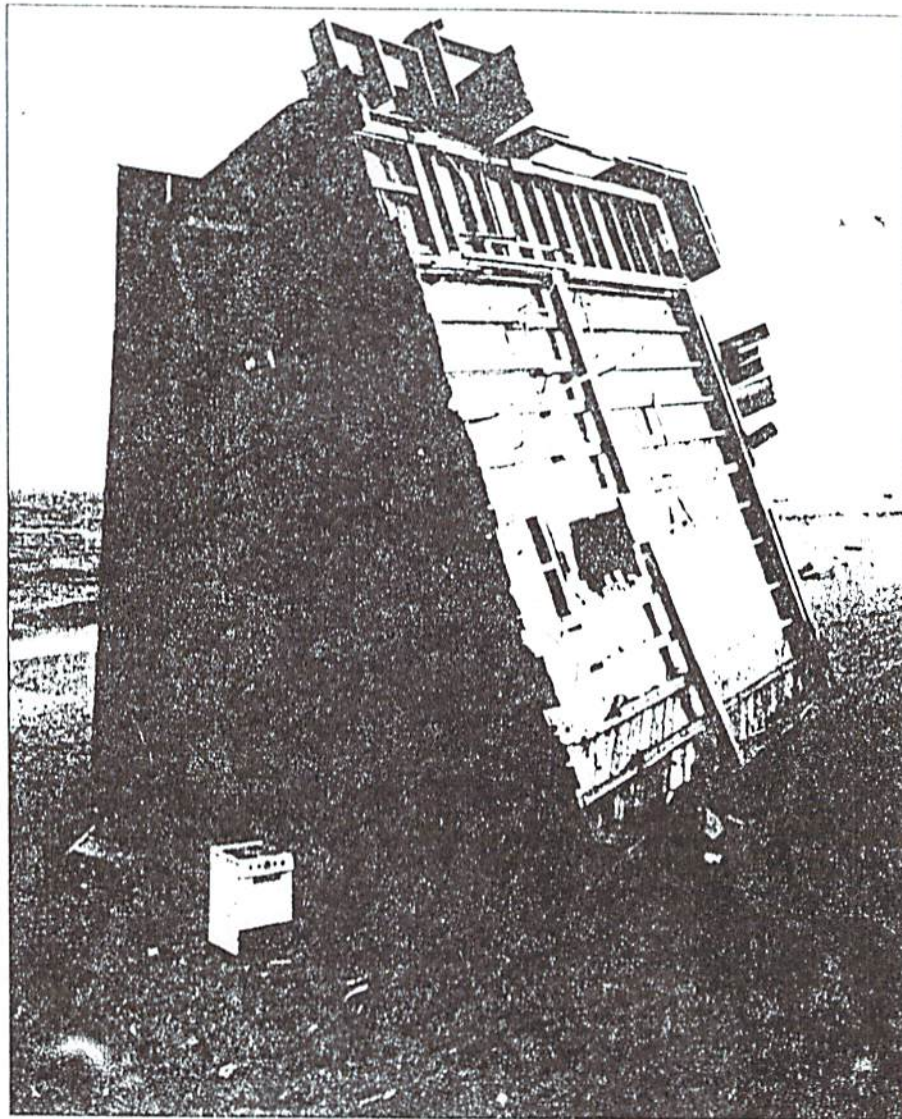


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## SEA WALL ATTACK

Despite enormous damage  
by last winter's storms,  
houses are already being rebuilt  
on the receding shores.

by Michael Kenney



*Plum Island, February 1978. [Jim Roycroft]*

FROM THE OCEAN the New England coast appears, this summer, pretty much as it always did. From Maine down through Massachusetts and Rhode Island, jutting blockades of dark volcanic bedrock alternate with long stretches of barrier beach, the sequence broken frequently by the towns which have been built where they are because of their proximity to the ocean and the coastal configurations, and which still take some of their life from the sea.

The remaining fishing fleets out of Gloucester and New Bedford are doing better, under the protection of the 200-mile fisheries zone, than they have in a long time. The beaches at Hampton and Plum Island, at Nantasket and on the Cape are crowded on hot summer afternoons; every tourist who is not on Bearskin Neck appears to be at Hyannis; and offshore the sailing winds are as steady as anyone can remember.

You have to stop and remind yourself what this same coastline looked like when the skies cleared on the morning of February 8, 1978 and revealed the damage a savage northeast storm had wrought over the preceding thirty-two hours.

But despite the obvious signs of recovery—too much recovery, some environmentalists have complained—it is not difficult to find the gaps along the shore in Hull, Revere, and Scituate, and along the southern Rhode Island coast, where the houses have vanished; or to find the bluffs at Manomet sliced back a generation by just two high tides.

This was a coastal storm—a classic nor'easter, the kind the coast is notorious for—and under the onslaught of gale-force winds and new moon tides, the ocean did things nobody thought it would, or could.

It started in the usual place, off the Carolinas. And by Monday morning, February 6, meteorologists could trace a strong cyclonic circulation system on satellite pictures. This observation was confirmed by reports from ships at sea between New York and Bermuda that were experiencing gusts up to fifty knots and mammoth seas.

"All night Monday and Tuesday, the massive system pumped hot tropical air to the highest reaches of the atmosphere, only to crystallize and fall," summarized Thomas Fair of the National Weather Service. "Tides during this period were unfortunately at an astronomical maximum. Continued presence of fierce easterly winds during several cycles of the tide brought water higher and higher, so that on Tuesday the highest tides ever recorded

occurred in Boston. By Tuesday evening the storm was just south of Nantucket and drifting slowly eastward."

It was awesome.

The National Ocean Survey maintains a tide gauge at Commonwealth Pier in Boston Harbor. At the peak of the storm, during the high tide on the morning of February 7, it recorded an elevation of 3.17 meters (10.4 feet) above mean sea level, producing a 15-foot tide in an area where the average rise and fall is 9.5 feet.

One has to go back over 100 years to find a storm surge that approached it—at Boston, in April of 1851, the sea rose 3.08 meters (10.1 feet) during a gale that tore down Minot's Ledge lighthouse.

Just off the New Hampshire coast, the crew of the "Jay Robertson", a drilling rig working on the controversial undersea cooling tunnels for the Seabrook Nuclear Power Plant, in anticipation of the storm, had jacked up the platform until it was 45 feet above mean low water. Waves still scraped its bottom. Aboard the Coast Guard vessel *Cape Cross*, hastening to the assistance of the grounded tanker *Global Hope* off Salem, an officer estimated the wave heights to be from 6.1 to 7.6 meters—20- to 25-foot seas.

Early Tuesday morning, a lieutenant at the fire station on Plum Island was describing the effects of the storm by telephone to the mainland. He was asked about the wind velocity. "Well," he replied, "it's hit 90 a couple of times in the last hour. I can see the dial and right now it's almost up there again. . . . No it's past 90. . . . Jesus, the needle just hit 100. . . ."

Even the more sheltered Coast Guard station at Gloucester was recording winds from 30 to 45 knots with waves increasing to 10 feet, and slamming in at a rate of one every 10 seconds.

Ashore, the fury of the storm struck from behind a curtain of snow.

It was still two hours before the late evening high tide when the waves crested over the twenty-foot sea walls in Revere, Nahant, and Winthrop, just north of Boston. Carrying sand and boulders with them, they crashed into homes and through garages, picking up cars and carrying them 200 feet farther inland.

Families retreated to second floors, then to their attics. The crew of a Metropolitan District Police amphibious vehicle described how they were riding level with second floor windows during much of Tuesday morning as they returned again

and again into the shoreline neighborhoods to evacuate hundreds of families.

Hull is a two-mile long spit of sand between the ocean and Hingham Bay, anchored at either end by glacial drumlins. The town is accustomed to taking a beating from northeasters and was barely back on its feet after being belted by a 1972 storm. By the second tidal surge on Tuesday morning, the entire midsection of Hull was under water. Along the streets that cut across the narrow peninsula, from ocean to bay, rescue workers could look down and see the tops of cars a few inches beneath the water. Some streets would be underwater for more than a week, and now, six months later, many families are still uprooted.

This time, the storm's fury did not stop with the low-lying areas. At Gunrock, a rocky ledge of land jutting out beyond the drumlin at the shoreward end of Hull, the waves piled up the steep rock face to pound against homes that had stood for generations, reducing some to piles of debris and shoving others off their foundations.

As Tuesday dawned and the enormity of what was happening was becoming clear, a second, and more destructive, onslaught was building up. By mid-morning it had reached the coast.

The Manomet Bluffs in Plymouth are a spectacular stretch of coastline, rising as high as 100 feet above a narrow beach with a clear view northeastward to the open ocean. Over the past forty years, some two dozen homes have been built along the crest of the bluffs and during Monday night, the residents could hear the surf crashing against their base. On Tuesday the waves returned to the attack with the morning tide, and for a few hours pounded, gouged and tore at the face of the cliffs. They were cut back as much as twenty feet and thousands of cubic yards of sand were carried out to sea. The gradual erosion of a generation had been accomplished in one turn of the tide.

About the same time, firemen, using aluminum lifeboats, were attempting to reach and rescue families trapped in their homes on Lighthouse Point at the entrance to Scituate Harbor. Responding to one call for help, Fire Captain Herbert Fulton maneuvered his boat through swirling waters to one home on Jericho Road and rescued a woman, her five-year-old daughter, Amy, and an elderly couple. As they headed back to higher ground, the sea wall was breached by waves cresting with the

tide. The ocean cascaded through the opening, smashing against the boat, spinning it out of control. A second wave—possibly the result of the surf rushing into Scituate Harbor, wrenching fishing boats from their moorings and hurling them up onto piers and into the streets of the town—crashed into the boat, capsizing it. Fulton grabbed for Amy twice, only to be knocked off his feet each time. The girl and the elderly man were both lost in the raging waves and drowned.

The storm's effects were even being felt along the south-facing coast of Rhode Island which was shielded from the northeasterly winds and the high waves they were driving. But even here, tides were running six to eight feet above normal and the cumulative effect of two abnormal tide cycles caused enough erosion to undercut the foundations of several dozen shoreline summer homes.

**T**HE TOTAL COST of that February northeaster is still being determined. Property damage along the coast is expected to reach close to a billion dollars by the time all the figures are in—in Scituate alone, 109 homes were destroyed; in Hull some 400 automobiles were swamped and had to be scrapped; sea walls the length of the coast had great chunks torn out of them.

In New England, there were fifty-four deaths caused by the storm. Hundreds of families were displaced and for many of them, social agencies found in the weeks afterward, the storm was the final blow to already fragile existences, and that it led to alcoholism, suicide attempts and desertions.

Still under investigation is the reason for the storm's destruction, and whether or not it could have been prevented.

Geologists Richard Jones and Barry Cameron had spent seven years studying the interaction of land and sea at Plum Island. By last summer they thought they had discovered a way to predict areas where storms pose special threats.

One particular spot, a dune field one hundred yards from the ocean and seemingly sheltered behind a protecting line of dunes, had been pinpointed by test borings, during last summer's field survey, as an area overwashed by storm surges several times in the past, and thus was potentially vulnerable to another storm. A tangle of cedar logs and other weathered debris they saw there this spring had been washed in during the February northeaster, and was

right where they predicted it should have been. "Even if we still don't know why that area is vulnerable," Cameron said, "it looks as if we have a useful tool for predicting overwash areas."

Jones plans to continue his research on the relationship of onshore effects—overwashes, erosion of dunes, and other damage—with conditions immediately offshore. Already there is some evidence that the normal formation of sandbars in some locations just offshore during the early winter months may have prevented onshore damage by reducing the energy of the February storm waves. "If you can find out what happened at Plum Island," his colleague Cameron stated, "you can apply it to areas where there are houses to protect."

In May, Jones brought a group of fellow geologists, biologists, and oceanographers together at Boston State College to report on the environmental effects of the storm. There were dramatic changes along the outer Cape from Monomoy to Provincetown, Graham Giese of the Coastal Research Center revealed. He detailed overwashes on all the barrier beaches, actual breaches at several points, the opening of a new inlet at Monomoy, and near Provincetown the widening of an inlet formed during a storm in January. An unexpected positive result of the storm, Giese said, was that in many cases the overwashes of sand had the effect of widening the barrier beaches on the landward side. Over the years, he added, the outer faces had been eroded away without any widening, a situation which the storm corrected. "We needed a storm like this," Giese stated, "to get the barriers back into shape."

David Nellis, a geologist who is also chairman of Scituate's conservation commission, found that at Peggotty Beach in that town, the crest of the beach was moved inland some fifty feet, "making it questionable whether the front line of houses can be rebuilt without being out beyond the high water line." Nellis also reported on the failure of a massive sea wall, protecting the line of homes huddled behind it, along Minot's Beach. Boston State colleague, Robert W. Spayne, described the storm's effects in the town's Fourth Cliff area, stating that "it is just as catastrophic when a storm can level off a drumlin and take out a spit, as when it totally destroys the houses."

The storm's force was also great enough to alter natural features even in seemingly

protected areas, according to D. W. Cadwell of Boston University. The damage on Thompson Island in Boston Harbor was equally divided between the northeast side facing the storm and the sheltered southeast side. Cadwell attributed the destruction on the southeast side of the island—mostly the undercutting of a grassy embankment—to the high waves that flooded the banks.

Nahant's rocky coastline did not suffer the dramatic overwashes that occurred along the barrier beaches, but there, observed James Allen of Northeastern University, the storm waves piled into the narrow cove beaches and washed out large amounts of gravel and cobble. Allen speculated that the profile of such beaches "was perpetually altered by the storm, because the material had been washed out into deeper water." Along the barrier beaches, he said, natural forces have already begun the rebuilding process, but it would take another catastrophic storm to replenish the rocky cove beaches.

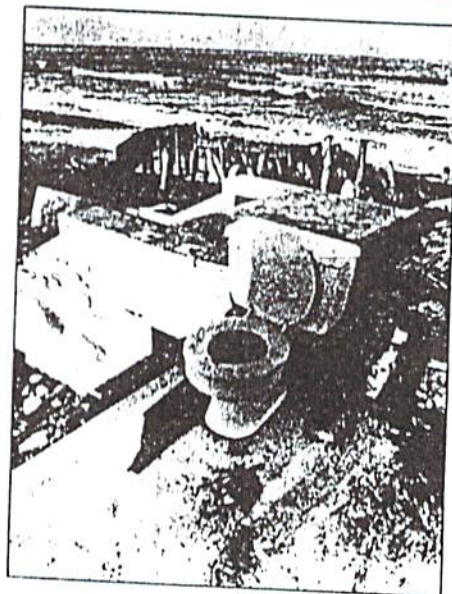
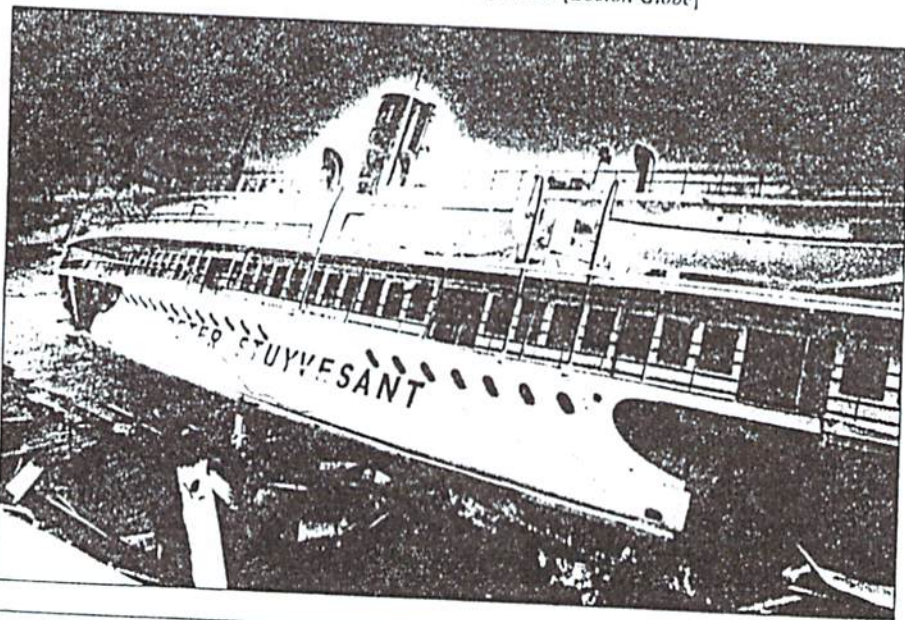
**B**UT DESPITE the hopes, shortly after the storm, that it would prove a catalyst for the adoption of new, more conservation oriented policies for coastal land use, it now appears that with the exception of perhaps one area in Scituate, the coast will be rebuilt almost exactly like it was before the storm.

In the weeks immediately following the storm, state and local environmental officials spoke enthusiastically—but guardedly—about the possibility of obtaining, for conservation or recreation, whole stretches of the coast that are now in private hands. The storm, suggested Norton Nickerson, a Tufts University biologist who heads the Massachusetts Association of Conservation Commissioners, "could be a Godsent opportunity" to acquire barrier beaches along Massachusetts Bay's South Shore.

Similar to the beaches that are now protected within the Cape Cod National Seashore, many of the South Shore beaches have been summer colonies for half a century or more; summer colonies with a peculiar history of being washed out and rebuilt, storm after storm. The difference this time was that the destruction was so widespread, and was the result of a storm of a magnitude large enough to capture the attention of government planners.

Urged on by state environmental officials—who were convinced that a great many houses knocked down had been

*Last February, the worst storm in recorded history hit the New England coast. Ships were torn from their moorings and houses reduced to rubble. Geologists are trying to determine coastal areas especially vulnerable to future storms and rough seas. [Boston Globe]*



built in places where they should not have been—Governor Michael S. Dukakis proposed a \$10 million bond issue that would provide funds enabling the state to purchase any coastal property its owner wished to sell. It was to be a completely voluntary program with no power of eminent domain attached to the legislation.

Although the priority would be given to acquiring blocks of shoreline property large enough so they could be developed either as state or town beaches, or else held as public conservation land, Assistant Environmental Affairs Secretary Joan Tuttle affirmed, "We don't want people to think we're trying to create a South Shore State Park. Clearly we're not going to do that."

Tuttle and other environmental officials never had the chance, even had they wanted to do something like that. Legislative leaders interpreted the bond issue as a threat to private property rights—and some local officials feared the impact of public acquisition on local property tax revenues—so the governor's request never even received the public hearing customary for most bills. When the legislative session ended in early July, it died without ever having gone to a vote. Killed along with it, however, was legislation which would have allowed property owners to rebuild their storm-damaged properties without review by local conservation commissions. In an election year it was clear there was more support within the legislature for the rebuilding bill than there was for the bond issue, and the trade-off was engineered by supporters of the bond issue who accepted a quiet defeat of their proposition to prevent what appeared to be almost certain passage of the legislation they dreaded.

Meanwhile, state disaster recovery officials had begun looking for funds with which to set up demonstration projects for owners who did want to rebuild, projects that would have provided an incentive in ways that would not only be resistant to the next storm, but also provide larger expanses of open space in the beach front communities in place of the existing tangle of small cottages located in places like Whitehorse Beach in Plymouth and along the Egypt and Hatherly beach areas of Scituate. To date, the fund raising for such an experimental design and construction program has been no more successful than the request for shoreline acquisition money had been.

By mid-summer, rebuilding was in full swing along the coast. Much of the patch-

ing up has already been done, and most of the heavy sea wall construction is being held in check until after the summer season. Along nearly all of the battered shoreline, contractors are at work on the houses that received serious structural damage, and restoring those that were ruined. Zoning and conservation approval has generally been given for structures that conform to federal regulations for construction in flood-prone areas. The new houses going up are usually elevated on pilings above the newly calculated flood-water levels, and often include "breakaway" ground-level walls to permit a flood tide to sluice through a house without causing serious structural damage.

There has never been any real question—even during the heady period when the environmentalists thought they had a chance to acquire much of the coastline for recreation or conservation—but that any reasonable rebuilding request would be allowed in the urbanized areas of Hull and Revere. The majority of the damaged and destroyed homes were being used as year-round residences, many by low income families, and there was little environmental gain to offset the clear hardships that would be created by not permitting rebuilding.

And without the proposed \$10 million acquisition bond issue, there was not much incentive for property owners in other communities to do anything other than accept low interest federal loans, or the payments from federal flood insurance policies, and rebuild.

Geologist David Nellis pointed out, at the Boston State College symposium on the storm, that "the coastal storm damage pattern has now become engraved in stone, so to speak, and the repetitive cycle of storm destruction followed by rebuilding followed again by destruction is only too well known."

Although he claimed it was still possible to change that cycle—banning the use of land for dwelling sites in high hazard areas, and by requiring more stringent codes for rebuilding in less hazardous ones—Nellis acknowledged that "realistically, change in land use is probably not going to occur at this time because the classic post-tragedy syndrome has developed. In describing this syndrome, one usually sees early respect for the forces of nature and a general feeling that things can be done differently to diminish future tragedies."

In assessing the impact of the storm on

Scituate, Nellis identified three separate areas where the damage ranged from eighty-five percent to total destruction. The houses there had been built in close proximity to the surf and received not only a great amount of water, but also were buffeted by "all types of water-laden debris such as sand, pebbles, cobbles, and stumps." Nellis said that geologically these places are usually barrier beaches composed of coarse material from pebbles to boulder in size. "Such coarse material," he continued, "is indicative of a high energy coastal zone which may serve as a criterion to designate areas of major storm impact."

But, he noted, as little as three months after the storm "opinion and pressure have built up so as to permit the rebuilding of just about everything. In fact, the concept today is to proceed with as much speed as possible and as little input of flood control codes as possible, and to rebuild everything that was destroyed by the storm. Minimal emphasis is being placed on the future safety of the residents in those areas affected by the blizzard of 1978."

A few applications to rebuild in Plymouth have been rejected on the grounds that the lots no longer have suitable frontage or access. In Scituate, Nellis's conservation commission has refused several requests to rebuild on Pegotty Beach, where the landward movement of the beach would have put the rebuilt homes out beyond the normal high-tide line. Most of these denials at the local conservation commission level have been appealed to state conservation agencies, and further appeals to the courts are likely.

It is along the Manomet Bluffs in Plymouth—so spectacular, and yet so fragile—that the persistence of shoreline property owners in the face of the forces of nature can best be seen. There, the bluffs below the houses are being encased in stone in an attempt to protect them from further erosion.

The projects range from a homemade barrier of 275-gallon oil drums filled with concrete and placed along the base of the bluffs to \$20,000 revetments of solid granite blocks. In all, more than 3,000 feet of such sea wall construction is planned, most of it to take place this fall. Several residents have had their homes moved back a whole twenty feet from the cut-back edge of the bluffs, while one owner had twenty feet sliced off the top of the cliffs and his house lowered onto a new foundation.

Right after the storm, one resident confessed that he was "ready to head for the hills. But, it was really only a temporary souring. It's a spooky situation. There's nothing like a northeaster, watching the wind and the rain coming off the ocean. There's nothing like it—as long as your bluff isn't washing away and your house isn't going over the edge."

It is uncertain how the new sea walls will perform under the onslaught of another coastal storm. Coastal geologists have warned that not only will constructing stone walls in front of bluff faces cut off the source of sand for the beaches and dunes in Barnstable and Sandwich on Cape Cod to the southeast, but it will also starve the beach along the dunes. And that could prevent the formation of the offshore sandbars that blunt the force of the storm waves when the northeasters strike this coast two or three times a year.

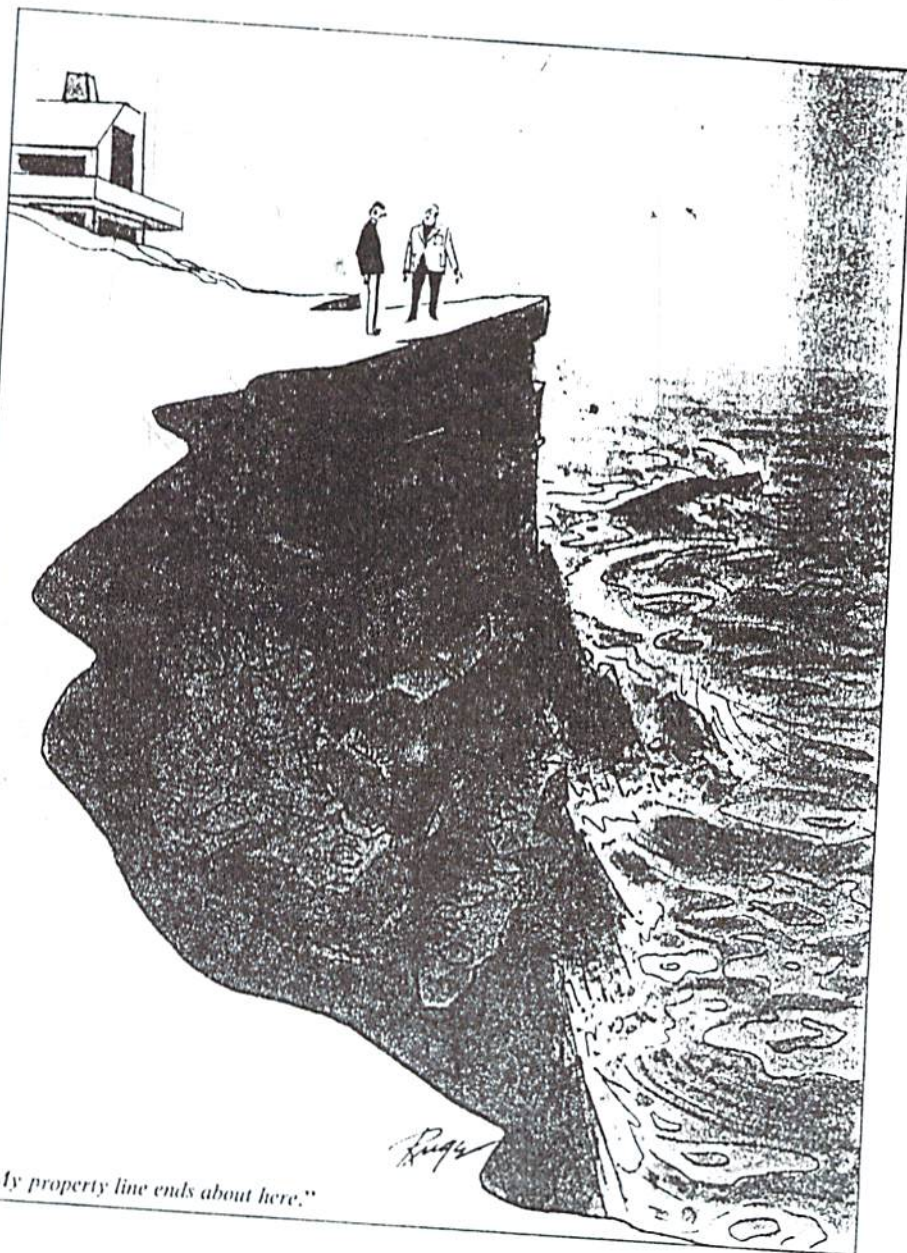
"We certainly realize the bad effects of many of these man-made structures," conceded Lester Smith, a geologist with the Massachusetts Coastal Zone Management agency. "But at the same time we realize the need to allow people to protect their property."

The new regulations covering construction along the coast have "grandfather clauses" that will allow for the protection of existing structures, but place restrictions on future building. "It's tough to do anything about existing developments," Smith said, "but we are going to try to have things better in new developments."

"It's not a retreat from the purist position that the best protection of the coastline is the coast itself—the offshore sandbars, the barrier beaches, and the bluffs that allow themselves to be gradually eroded. It's just that we're being realistic."

For the present, it appears that the absence of strong public support for the acquisition and conservation of the coastline, coupled with the determination of shore property owners to rebuild, have proved stronger than the fury of the February storm. Six months afterward, you bump into someone on a yacht club porch you had not seen since last summer and ask how he had fared in Hull during the storm. "Hey, not bad," he replies. "We've got a new car, a new furnace, most of a new kitchen, and the basement is all done over."

Michael Kenney, a member of the Boston Globe staff, covered the 1978 winter storms along the New England Coast.



"My property line ends about here."